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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/901,933	07/09/2001	Patrick Foster	335.6214USV	8565

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EXAMINER

THORNTON, YVETTE C

ART UNIT	PAPER NUMBER
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1752

DATE MAILED: 12/04/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/901,933

Applicant(s)

FOSTER ET AL.

Examiner

Yvette C. Thornton

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 09 July 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 14-33 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 14-18, 21, 22 and 27-33 is/are rejected.
- 7) ☐ Claim(s) 19, 20, 23, 24 and 26 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### DETAILED ACTION

This is written in reference to application number 09/901933 filed on July 9, 2001.

#### *Election/Restrictions*

1. The examiner notes the election/restriction and election of species requirement set forth in Paper No. 3. This examiner has reviewed the pending claims and hereby withdraws the said requirement.
2. Claims 1-13 have been cancelled. Claims 14-33 are currently pending and are examined herein.

#### *Claim Objections*

3. Claims 29-30, 32 and 33 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claims 29 and 30 set forth that the hydroxyl containing polymer comprises specific amounts of hydroxystyrene and isobornyl (meth)acrylate, however claims 26 set forth that the hydroxyl-containing polymer comprises biphenyl (meth)acrylate and hydroxyethyl (meth)acrylate. Claim 32 is identical to claim 26 and adds no further limitations to the instant claims. Claim 33 further limits process steps, which are not present in, claim 26 from which it depends. Correction is required..

#### *00000Claim Rejections - 35 USC § 112*

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

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5. Claims 29-33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
6. Claims 29-33 recite the limitation "the process of claims 26" in line 1 of each of the said claims. There is insufficient antecedent basis for this limitation in the claim. Claim 26 pertains to a coated substrate. The examiner is unclear if the said claims were meant to depend on claim 28 or if the said claims are somehow further limiting the coated substrate of claims 26. Clarification is requested.
7. For the purposes of examination, claims 29-33 are interpreted as being further limiting of the process claims 32.

***Claim Rejections - 35 USC § 102***

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

9. The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of

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the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

10. Claims 14-15, 17-18, 28 and 33 are rejected under 35 U.S.C. 102(e) as being anticipated by Pavelchek et al. (US 6316165 B1). Pavelchek teaches a radiation absorbing composition suitable for use as antireflective coating (ARC) compositions with photoresist compositions (c. 2, l. 10-12). The said composition comprises a low molecular weight polymer resin, which is capable of providing a highly planarizing coating (c. 4, l. 32-35). The said resin is preferably synthesized by polymerizing two or more different monomers where at least one of the monomers includes a chromophore group (c. 5, l. 43-47). Crosslinking-type antireflective compositions of the invention also generally contain a crosslinker component. A variety of crosslinkers may be employed. Suitable examples include amine-based crosslinkers such as melamine materials, glycourils, benzoquanamines and urea-based materials. Low basicity antireflective composition crosslinkers are particularly preferred such as a methoxy methylated glycouril corresponding to given formula (III) (c. 8, l. 15-56). Crosslinking antireflective compositions of the taught invention preferably further comprise an acid or acid generator compound, particularly a thermal acid generator for catalyzing or promoting crosslinking during curing of an antireflective coating layer. A variety of known thermal acid generators are suitably employed such as 2,4,4,6-tetrabromocyclohexadienone, benzoin tosylate, 4-nitrobenzyl tosylate and other alkylesters of organic sulfonic acids (c. 9, l. 12-67).

Example 5 exemplifies an ARC composition comprising a terpolymer resin of 9-anthracenemethyl methacrylate, 2-hydroxyethyl methacrylate and methyl methacrylate;

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POWDERLINK 1174 crosslinker (methoxy methylated glycouril c. 8, l. 53-56); and an acid generator di-t-butyl diphenyl iodonium camphorsulfonate. The liquid ARC is spin coated onto a silicon wafer and thermally cured for 60 seconds. The cured ARC is then overcoated with a positive acting photoresist UV5. The resist layer is soft-baked, exposed to patterned radiation, post-exposure baked and developed with an alkaline aqueous solution. The underlying ARC layer is etched with an oxygen/fluorocarbon plasma (c. 16, l. 50-c. 17, l. 9). It is the examiner's position that the taught terpolymer meets the limitation of a hydroxyl-containing polymer; the taught POWDERLINK 1174 crosslinker meets the limitation of an amino crosslinking agent; and di-t-butyl diphenyl iodonium camphorsulfonate meets the limitation of a thermal acid generator.

11. Claims 14-15, 27-28 and 33 are rejected under 35 U.S.C. 102(e) as being anticipated by Thackeray et al. (US 6165697 A). Thackeray teaches an antihalation composition comprising a resin binder and a material capable of causing a thermally induced crosslinking reaction of the resin binder (abstract). The said composition may further comprise an acid or acid generator compound to catalyze the reaction between the resin binder and the crosslinking compound (c. 2, l. 63-67). A particularly preferred antihalation composition comprises an amine-based thermal crosslinker and a phenol based resin binder (c. 3, l. 54-c.4, l. 54). Suitable amine-based thermal crosslinkers include melamine-formaldehyde resins, glycoluril-formaldehyde resins and urea-based resins. Suitable phenol based resin binders include novolak resins; poly(vinylphenols) and copolymers of the same with styrene; poly(meth)acrylic acid copolymers; copolymers containing 2-hydroxyethylmethacrylate and 2-hydroxypropylmethacrylate; polyvinyl alcohols; and alkali soluble styrene-allyl alcohol

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copolymers (c. 4, l. 20-31). Preferably a thermal acid generator is employed. A variety of known thermal acid generators are suitably employed such as 2,4,4,6-tetrabromocyclohexadienone, benzoin tosylate, 4-nitrobenzyl tosylate and other alkylesters of organic sulfonic acids (c. 6, l. 11-40). Example 1 exemplifies an antihalation composition comprising novolak resin binder, hexamethoxymethylmelamine crosslinker and 2,4,4,6-tetrabromocyclohexadienone as the thermal acid generator. Example 3 exemplifies the said composition (ex. 1) being coated on a silicon wafer and baked. The wafer was then overcoated with a deep UV photoresist. The wafer was exposed on a excimer laser stepper, post-baked and developed to form a pattern. Thackeray also teaches that bared antihalation layer can be removed and the underlying substrate can be altered (see c. 9, l. 34-53 and claim 1).

*Claim Rejections - 35 USC § 103*

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 16 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pavelchek et al. (US 6316165 B1) as applied to claims 14-15, 17-18, 28 and 33 above. Pavelchek as discussed above teaches all the limitations of the claims except it fails to exemplify a thermal acid generator of the general structure of instant claim 16 or a cross-linking agent of the general formula of instant claim 27. Pavelchek does however teach that a variety of known thermal acid generators are suitably employed such as 2,4,4,6-

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tetrabromocyclohexadienone, benzoin tosylate, 4-nitrobenzyl tosylate and other alkylesters of organic sulfonic acids (c. 9, l. 12-67). It is the examiner's position that benzoin tosylate and 4-nitrobenzyl tosylate meets the limitations of instant claims 16. One of ordinary skill in the art would have been motivated to use any of the taught thermal acid generators in an antireflective composition such as that exemplified in example 5. Furthermore, Pavelchek teaches that a variety of crosslinkers may be employed. Suitable examples include amine-based crosslinkers such as melamine materials, glycourils, benzoquanamines and urea-based materials. It is the examiner's position that a melamine derivative would meet the limitation of instant claim 27. One of ordinary skill in the art would have been motivated to use any of the taught amine based crosslinkers in an antireflective composition such as that exemplified in example 5. One of ordinary skill in the art would have been motivated by the teaching of Pavelchek to coat a substrate with an antireflective coating comprising a resin material such as that synthesized in example 1 that comprises a hydroxy containing monomer; a melamine crosslinker component; and benzoin tosylate or 4-nitrobenzyl tosylate as a thermal acid generator in order to form an antireflective coating which is overcoated with a positive photosensitive resist, exposed and developed the formed element to provide a relief images that permits selective processing of a substrate (c. 1, l. 20-25).

14. Claims 16, 21, 22 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thackeray et al. (US 6165697 A) as applied to claims 14-15, 27-28 and 33 above.

Thackeray as discussed above teaches all the limitations of the claims except it fails to exemplify a thermal acid generator of the general structure of instant claim 16 or a cross-linking agent of the general formula of instant claim 27. Pavelchek does however teach that a



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variety of known thermal acid generators are suitably employed such as 2,4,4,6-tetrabromocyclohexadienone, benzoin tosylate, 4-nitrobenzyl tosylate and other alkylesters of organic sulfonic acids (c. 3, l. 54-c. 4, l. 17). It is the examiner's position that benzoin tosylate and 4-nitrobenzyl tosylate meets the limitations of instant claims 16. One of ordinary skill in the art would have been motivated to use any of the taught amine based crosslinkers in an antireflective composition such as that exemplified in example 1.

Thackeray also fails to teach a hydroxyl containing polymer comprising styrene and an allyl alcohol as set forth in instant claim 21. Thackeray does teach that suitable phenol based resin binders include novolak resins; poly(vinylphenols) and copolymers of the same with styrene; poly(meth)acrylic acid copolymers; copolymers containing 2-hydroxyethylmethacrylate and 2-hydroxypropylmethacrylate; polyvinyl alcohols; and alkali soluble styrene-allyl alcohol copolymers (c. 4, l. 20-31). One of ordinary skill in the art would have been motivated to use any of the taught phenol based resin binders in the taught composition. One of ordinary skill in the art would have been motivated by the teaching of Thackeray to coat a substrate with an antihalation composition comprising a phenol based resin material such as a styrene-allyl alcohol copolymer; a melamine crosslinker component; and benzoin tosylate or 4-nitrobenzyl tosylate as a thermal acid generator in order to form an antireflective coating which is overcoated with a positive photosensitive resist, exposed and developed the formed element to provide a relief images that permits selective processing of a substrate (see claim 1). One of ordinary skill would expect that a styrene-allyl alcohol copolymer would at least have a monomeric ration of 50:50.

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15. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pavelchek et al. (US 6316165 B1) as applied to claims 14-18, 27-28 and 33 above or Thackeray et al. (US 6165697 A) as applied to claims 14-16, 21-22, 27-28, 30 and 33 above and in further view of Bailey et al. (US 4788127 A). Pavelchek and Thackeray both teach a process wherein a resist is overcoated the taught antireflective and antihalation layer, respectively. Pavelchek exemplifies the use of UV5 photoresist from Shipley. Thackeray exemplifies the use of MEGAPOSIT SNR248-1.0 from Shipley. Neither reference offers any further detail about the specific photoresist. One of ordinary skill in the art would have been motivated to use any photoresist composition which conventionally used in bilayer resist systems. Bailey (US 4788127) teaches a photoresist composition comprising a photosensitive compound and an interpolymers of a silicon-containing monomer and an hydroxystyrene. The resist composition exhibits superior thermal stability and dissolution rate and good resistance to an oxygen plasma etch (abstract). Bailey teaches that the said composition is preferably used in bilayer resist systems coated on a support (c. 2, l. 44-48). One of ordinary skill in the art would have been motivated by the teachings of Bailey to use a photosensitive composition comprising a silicon-containing monomer as the topcoat photosensitive layer of Pavelchek or Thackeray in order to improve thermal stability, dissolution rate and etch resistance of the formed element.

*Allowable Subject Matter*

16. Claims 19-20, 23-24, 26, 29, 31 and 32 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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17. Claims 29, 31 and 32 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

18. The following is a statement of reasons for the indication of allowable subject matter: review of the prior art failed to teach and/or suggest the use of the specific compounds of instant claims 19, 23 and 26 in combination with an amino crosslinking agent and a thermal acid generator as set forth in the instant claims.

### *Conclusion*

19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Foster et al. (US 6054248 A) which teaches a hydroxy-diisocyanate thermally cured undercoat for 193nm lithography.
- Foster et al. (US 6323287 B1) which teaches a hydroxy-amino thermally cured undercoat for 193nm lithography.
- Foster et al. (US 2002/0007018 A1) which teaches a hydroxy-amino thermally cured undercoat for 193nm lithography.
- De et al. (US 2002/0173594 A1) which teaches a thermally cured underlayer for lithographic application.
- Pavelchek et al. (US 2002/0022196 A1) which teaches a planarizing antireflective coating composition.
- Thackeray et al. (US 2002/0009670 A1) which teaches antihalation compositions.
- Trefonas, III et al. (US 2002/0031729 A1) which teaches antireflective coating compositions.
- Singer et al. (US 4454274 a1) which teaches aminoplast curable coating compositions containing cycloaliphatic sulfonic acid esters as latent acid catalysts.

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- Graziano et al. (US 5376504 A) which teaches acid hardening photoresists comprising a purified hexamethoxy methylmelamine resin as a crosslinker.


20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yvette C. Thornton whose telephone number is 703-305-0589. The examiner can normally be reached on Monday-Thursday 8-6:30.

21. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Janet C. Baxter can be reached on 703-308-2303. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

22. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1193.

**\*\*Please note that the examiner has recently changed her name from "Clarke" to "Thornton".\*\***

yct yct  
December 2, 2002

  
JANET BAXTER  
SUPERVISOR, PATENT EXAMINER  
TECHNICAL SERVICES GROUP